



ST. MARY'S
UNIVERSITY

Digital Commons at St. Mary's University

Faculty Articles

School of Law Faculty Scholarship

2007

State Practice in the Management and Allocation of Transboundary Groundwater Resources in North America

Gabriel Eckstein

St. Mary's University School of Law, gabrieleckstein@law.tamu.edu

Amy Hardberger

ahardberger@stmarytx.edu

Follow this and additional works at: <https://commons.stmarytx.edu/facarticles>



Part of the [Water Law Commons](#)

Recommended Citation

Gabriel Eckstein and Amy Hardberger, State Practice in the Management and Allocation of Transboundary Groundwater Resources in North America, 18 Yearbook of Int'l Env'tl. L. 96 (2007).

This Article is brought to you for free and open access by the School of Law Faculty Scholarship at Digital Commons at St. Mary's University. It has been accepted for inclusion in Faculty Articles by an authorized administrator of Digital Commons at St. Mary's University. For more information, please contact egoode@stmarytx.edu, sfowler@stmarytx.edu.

State Practice in the Management and Allocation of Transboundary Groundwater Resources in North America

Gabriel Eckstein and Amy Hardberger

I. INTRODUCTION

In recent years, groundwater has garnered growing attention as a significant source of freshwater. Groundwater is currently the most extracted natural resource in the world with a global withdrawal rate of 600–700 cubic kilometres per year.¹ In Europe, groundwater accounts for 60–99 percent of drinking water, while, throughout the United States, the percentage ranges from 50–97 percent.² In some rural areas, groundwater meets nearly 100 percent of users' daily needs.³ As water demands continue to increase globally so will the dependence on groundwater. This increased reliance presents challenges because many aquifers are subject to waste, contamination, overexploitation, and other maladies that threaten hundreds of aquifers worldwide and make the need for agreements even more necessary.⁴ These challenges are especially evident in the international context.

Historically, the significance of groundwater as a source of freshwater was disregarded, its hydrological dynamics misunderstood, and its management inconsistent and sometimes irrational. As a result, or possibly another symptom, groundwater resources received considerably less attention in international law and relations among nations than have surface waters.⁵ Today, while a growing body of international law governs transboundary rivers and lakes worldwide, a gap in the law means that virtually

¹ See S.S.D. Foster and P.J. Chilton, *Groundwater: The Processes and Global Significance of Aquifer Degradation* 358 Phil. Trans. Royal Soc'y London B: Biological Sciences 1957 (2003), <<http://www.pubmedcentral.nih.gov/picrender.fcgi?artid=1693287&blobtype=pdf>>; see also Water for People, Water for Life, the United Nations World Water Development Report, at 78 (2003).

² G. Eckstein and Y. Eckstein, *A Hydrogeological Approach to Transboundary Ground Water Resources and International Law* 19 Amer. U. Int'l L. Rev. 201 at 202 (2003).

³ *Texas Water Development Board* 2 Water for Texas 13 (2007).

⁴ See G. Eckstein, *Commentary on the U.N. International Law Commission's Draft Articles on the Law of Transboundary Aquifers* 18 Colo. J. Int'l Env't'l L. & Pol'y 537 at 539, n. 7 (2007) (providing examples of overexploitation and degradation of aquifers worldwide).

⁵ Eckstein and Eckstein, *supra* note 2 at 222–31.

no widely accepted international norms govern transboundary aquifers.⁶ This gap, however, may be slowly filling as a result of the development of customary law, which is traceable, in large part, to the conduct of subnational actors.

International law is generally understood to emerge from formal and direct lawmaking actions by the larger international community. Treaties and conventions adopted by states represent formally accepted and codified norms of international law.⁷ Another source of international law is defined by customary international law. Customary international law is international law that emerges from a broad and consistent practice of states justified by a belief that such conduct is legally appropriate and mandated.⁸ In the case of transboundary groundwater resources, while few formal international instruments focus on transboundary aquifers,⁹ a growing number of subnational practices around the world suggest an emerging trend in the management of transboundary groundwater resources. Subnational political units are engaging in arrangements addressing the management of aquifers that traverse their international boundaries. In the European context, where most small international transboundary aquifers are now managed directly by local authorities under local transboundary arrangements,¹⁰ this trend appears more formalized because of the European Outline Convention on the Transfrontier Cooperation between Territorial Communities or Authorities (European Outline Convention), which authorizes subnational units to enter into transboundary arrangements under certain circumstances.¹¹ In contrast, in North America, the respective federal governments have provided little if any guidance for, or shown any interest in, such local initiatives. Nonetheless, even in North America, it is safe to say that transboundary groundwater resources are now legitimate subjects for international cooperation.¹²

⁶ See generally Eckstein, *supra* note 4.

⁷ See Ian Brownlie, *Principles of Public International Law*, at 11–12 (5th edn, 1998); see also Statute of the International Court of Justice, 26 June 1945, 59 Stat. 1060, Article 38(1)(a), <<http://www.icj-cij.org/documents/index.php?p1=4&p2=2&p3=0>>.

⁸ See generally Brownlie, *supra* note 7 at 4–11; see also Statute of the International Court of Justice, *supra* note 7, Article 38(1)(b).

⁹ See Eckstein and Eckstein, *supra* note 2 at 224–7.

¹⁰ Jochen Sohnle, *Transboundary Aquifers and Local Transfrontier Co-operation in Europe*, unpublished report prepared for the UNILC Special Rapporteur, His Excellency, Ambassador Chusei Yamada and the UNESCO Ground Water Experts Group, February 2006 [on file with authors].

¹¹ European Outline Convention on the Transfrontier Cooperation between Territorial Communities or Authorities (21 May 1980), 20 I.L.M. 315 (1981) [European Outline Convention]. This purpose of this treaty is to encourage and facilitate trans-border cooperation between communities or authorities on both sides of an international boundary on issues relevant to both sides, especially in the fields of 'regional, urban and rural development, environmental protection, the improvement of public facilities and services and mutual assistance in emergencies' (*ibid.* at Preamble).

¹² Cf. G. Eckstein, *A Hydrogeological Perspective of the Status of Ground Water Resources Under the UN Watercourse Convention* 30 Columbia J. of Env't'l Law 525 at 528–9 (2005)

The purpose of this article is to investigate more closely this trend and to identify specific concepts resulting from such local initiatives that might serve as a basis for customary international law. While it is not intended as a comparative study in relation to the European experience, it presents the North American experience in a way that should be informative for such an inquiry in the future. Specifically, this article focuses on the governance of transboundary groundwater resources in North America. It begins by identifying and reviewing various arrangements over transboundary aquifers between Mexico and the United States, between Canada and the United States, and between the continental states of the United States.¹³ Although the arrangements discussed in this article represent diverse geographic and geologic conditions, commonalities in norms and principles can be identified in areas such as cooperation, prior notification of planned activities, sharing of data and information, public participation, and a preference for subsidiarity and local solutions for local issues.

This article proposes that many of these commonalities evidence emerging state practice and should be considered and evaluated as bases for emerging customary international law. Moreover, recent trends suggest a change in the function of regional agreements and their role in the development of international custom as evidenced by the growing importance and effectiveness of local and regional transboundary arrangements¹⁴ that are tailored to local characteristics and circumstances. Significantly, these trends are especially unique in that the majority of the arrangements identified are unofficial pacts without formal endorsement of the respective governments. Additionally, of those arrangements, the vast majority are subnational pacts rather than pacts between national governments. Ultimately, in identifying and characterizing such commonalities and characteristics, as well as the experiences on which they are based, this study aims to offer insight into evolving customary international law as well as suggestions for the development of new arrangements related to the management of transboundary groundwater resources.

(asserting that internationally shared groundwater resources are now 'a legitimate subject of international law').

¹³ Full text versions of all of the agreements discussed in this article can be found at <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>.

¹⁴ As used in this article, the phrase 'local and regional transboundary arrangements' denotes agreements over freshwater resources that traverse a political boundary. This includes arrangements between entities in different countries as well as those between subnational units. The term 'arrangement' is used to encompass agreements that may be those that are officially or formally recognized by the respective governments as well as those that are either informal or non-binding agreements or those not formally recognized by the respective sovereign. An example of the latter is an internationally transboundary waters arrangement entered into by local entities on either side of a political border but which are not officially recognized by the respective national governments.

II. THE ARRANGEMENTS

1. Mexico–United States Border

The problems that can arise from an international shared resource are clearly seen on the border between the United States and Mexico. The Mexico-US border extends more than 3,100 kilometres from the Gulf of Mexico to the Pacific Ocean¹⁵ and overlies as many as twenty aquifers that traverse the international boundary.¹⁶ No formal federal agreements exist between Mexico and the United States addressing the management, allocation, or protection of any of the border aquifers. However, a number of instruments encourage and facilitate cooperation between the two nations at the local and at the national levels in the management of transboundary aquifers.

A. Minutes of the International Boundary and Water Commission (IBWC)

The IBWC is a bi-national commission, composed of a Mexican and a United States section, responsible for enforcing water treaties and settling disputes on the Mexico-US border.¹⁷ The commission's current structure and water mandate originates with the 1944 Treaty between the United States of America and Mexico Relating to the utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande (1944 US-Mexico Treaty).¹⁸ The IBWC implements its mandate and commitments through the formulation of minutes. Minutes are decisions or recommendations of the IBWC, which, once approved by both governments, become binding obligations on the countries.¹⁹

¹⁵ See D. Woodward and R. Durall, *United States-Mexico Border Area, as Delineated by a Shared-Water Resources Perspective*, U.S. Dept. of the Interior Field Coordinating Fact Sheet 1, February 1996, <http://www.cerc.usgs.gov/FCC/pubs/Fact_sheets/Fact_1/DOI_US-MX_Border_FCC_Fact_sheet_1.html>.

¹⁶ See Good Neighbor Environmental Board, *Water Resources Management on the U.S.-Mexico Border*, Eighth Report to the President and the Congress of the United States (2005), <<http://www.epa.gov/ocem/gneb/gneb8threport/gneb8threport.pdf>> (identifying twenty aquifers on the border); and S. Mumme, *Minute 242 and Beyond: Challenges and Opportunities for Managing Transboundary Groundwater on the Mexico-U.S. Border* 40 Nat. Resources J. 341 at 344 and 363–77 (2000) (identifying eighteen aquifers on the border).

¹⁷ S. Mumme, *Innovation and Reform in Transboundary Resource Management: A Critical Look at the International Boundary and Water Commission, United States and Mexico* 33 Nat. Res. J. 93 at 94–5 (1993).

¹⁸ Treaty between the United States of America and Mexico Relating to the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, and supplementary protocol, 59 Stat. 1219 (14 November 1944).

¹⁹ Alberto Szekely, *How to Accommodate an Uncertain Future into Institutional Responsiveness and Planning: The Case of Mexico and the United States*, 33 Nat. Resources J. 397 at 398 (1993).

Minute 242 of the IBWC was enacted in August 1973.²⁰ It was designed to address the increasing salinity of the Colorado River and requires the United States to deliver water of a minimum water salinity level to Mexico. Paragraphs 5 and 6 of Minute 242 also address groundwater in the border region. To the extent that these paragraphs create binding obligations, they represent the only evidence of a formal agreement between Mexico and the United States on the region's transboundary aquifers. Paragraph 5 provides that, pending the development of a 'comprehensive' groundwater agreement for the border region, both countries agree to limit groundwater pumping within a precisely defined geographic region along the Arizona-Sonora border near San Luis to specifically enumerated withdrawal targets.²¹ Imposing a more aspirational obligation, paragraph 6 requires both countries to consult each other prior to pursuing any new development of surface or groundwater resources, or any other action, that could adversely impact the other country. This obligation, drafted with the stated goal of 'avoiding future problems,' applies to all transboundary aquifers along the border.²²

Another agreement that is relevant to the border's groundwater resources is Minute 289.²³ Enacted in November 1992, it is designed to address water quality in the lower Rio Grande River along the Mexico-US border. Although the majority of the minute focuses on the Rio Grande and Colorado rivers, paragraph 4 references the Integrated Border Environmental Plan adopted by Mexico and the United States in 1992 and calls for the establishment of a water monitoring program and database to observe surface and groundwater quality along the US-Mexico border. The paragraph also lists those agencies on both sides of the border that are to participate in the joint monitoring program.²⁴

*B. Memorandum of Understanding between City of Juárez, Mexico Utilities and the El Paso Water Utilities Public Services Board of the City of El Paso, Texas (Juárez-El Paso MOU)*²⁵

The Hueco Bolson Aquifer, which underlies the border sister cities of Juárez, Chihuahua, in Mexico and El Paso, Texas, in the United States,

²⁰ Minute 242: Permanent and Definite Solution to the International Problem of the Salinity of the Colorado River, International Boundary and Water Commission (30 August 1974), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Minute 242].

²¹ *Ibid.* ²² *Ibid.*

²³ Minute 289: Observation of the Quality of the Waters Along the United States and Mexico Border, International Boundary and Water Commission (11 December 1992), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>.

²⁴ *Ibid.*

²⁵ Memorandum of Understanding between City of Juárez, Mexico Utilities and the El Paso Water Utilities Public Services Board of the City of El Paso, Texas (6 December 1999) [Juárez-El Paso MOU], <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>.

serves as a principal source of freshwater for both communities: nearly 100 percent for Juárez, and approximately 30 percent for El Paso.²⁶ As a result of this dependence, the aquifer has undergone considerable mining in recent decades, and concerns have been raised over the aquifer's viability as an ongoing source of freshwater for the region.

In an effort to generate cooperation over the management and exploitation of the Hueco Bolson, the municipal utility companies of the two cities entered into a legally non-binding memorandum of understanding in 1999. This arrangement focuses on the region's groundwater by 'seek[ing] to identify the mechanisms between the parties to increase communications, cooperation, and implementation of transboundary projects of common interest.' In its stated goals of 'general objectives,' the Juárez-El Paso MOU alludes to data and information sharing related to transboundary natural resources and to cooperation in the management, use, and protection of natural resources that traverse an international boundary.²⁷

*C. United States of America and the United Mexican States Agreement on Cooperation for the Protection and Improvement of the Environment in the Border Area (La Paz Agreement)*²⁸

The La Paz Agreement promotes cooperation for environmental protection on the border. While the agreement is not directly related to groundwater resources, it does contain general language that implicates transboundary aquifers. The treaty obligates both parties to prevent, reduce, and eliminate sources of pollution in their respective territory where such pollution affects the others' border region; cooperate in addressing environmental problems of mutual interest; and coordinate practical, legal, institutional, and technical measures designed to protect environmental quality in the border area, including coordinating national programs, scientific and educational exchanges, environmental monitoring, environmental impact assessment, and regular exchanges of data and information on transboundary pollution originating in each country's territory.²⁹ It is noteworthy that none of the provisions in this agreement can prejudice or otherwise affect existing or

²⁶ *Final Report: Second Coordination Workshop, UNESCO/OAS ISARM Americas Programme—Transboundary Aquifers of the Americas*, El Paso, Texas, 10–12 November 2004 (2005), <<http://www.oas.org/usde/isarm/Documents/English/ISARM%20Americas%202004-%20El%20Paso%20Workshop%20Report.pdf>>.

²⁷ Juárez-El Paso MOU, *supra* note 25.

²⁸ United States of America and the United Mexican States Agreement on Cooperation for the Protection and Improvement of the Environment in the Border Area (14 August 1983), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [La Paz Agreement].

²⁹ *Ibid.*, Article 2 and 3.

future agreements concluded between the United States and Mexico including those relating to the region's waters.³⁰

*D. United States–Mexico Transboundary Aquifer Assessment Act*³¹

The United States–Mexico Transboundary Aquifer Assessment Act was designed to address the lack of consensus between the two nations on the source and availability of future water supplies along the border. The Act mandates the creation of a scientific program to comprehensively assess the region's transboundary aquifers, especially those deemed to be priority transboundary aquifers.³² The program is also expected to develop the scientific foundation for national, state, and local officials to address pressing water resource challenges in the region. It directs the secretary of the US Department of the Interior to implement this program in cooperation with the IBWC, the three participating US border states of Arizona, New Mexico, and Texas, certain water resources research institutes, affected Indian tribes, and other appropriate federal and state agencies. While the Act itself is not a transboundary arrangement, it does obligate the secretary, 'to the maximum extent practicable,' to work with all of these entities 'to develop partnerships with, and receive input from, relevant organizations in Mexico to carry out the program.'³³ The Act was signed into law in December 2006. While it is authorized to be funded for up to US \$50 million over its ten-year life span, it was initially funded for US \$1 million in early 2008.³⁴

The Act specifically provides that it shall not affect: (1) the jurisdiction or responsibility of a participating state with respect to managing its surface or groundwater resources; (2) the water rights of any person or entity using water from a transboundary aquifer; or (3) state water law or an interstate

³⁰ *Ibid.*, Article 18.

³¹ United States–Mexico Transboundary Aquifer Assessment Act, Public Law 109–448, 120 Stat. 3328–3332, issued on 22 December 2006, <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>.

³² *Ibid.* at sec. 4.

³³ *Ibid.* at sec. 4 and 5. According to the US Geological Survey at the US Department of Interior, one of the agencies tasked with implementing this act, '[e]arly into the program, it would be essential that binational consensus be reached on common investigative approaches, common field data collection protocols, laboratory methodologies, and data management, documentation, and reporting systems. Once these technical issues are resolved, it would be much easier to streamline the treaty requirements related to the review and public release of impartial, transboundary scientific data. Such consensus has been reached in the past for transboundary investigations having limited scope. Obtaining this consensus for the entire Border region would greatly enhance transboundary scientific collaboration in the future.' Statement of Charles G. Groat, Director, US Geological Survey, US Department of the Interior, to the Subcommittee on Water and Power, US Senate Committee on Energy and Natural Resource, 19 May 2004.

³⁴ *Ibid.* at sec. 8; US Geological Survey, FY 2008 Budget Funding Tables, <http://www.usgs.gov/budget/2008/08funding_tables.asp>.

compact or international treaty governing water. The Act also states that it shall not delay or alter the implementation or operation of any works within the territorial limits of the United States relating to the waters governed by the 1944 US-Mexico Treaty.³⁵

2. Canada-US Border

As expansive as the Mexico-US border is, the border region between Canada and the United States is more than three times that length—approximately 11,370 kilometres. While this border region is also marked by diverse climates and geography, it contains far greater quantities of freshwater and nearly 300 transboundary waterways and aquifers. Unlike the Mexico-US region, Canada and the United States do not compete for groundwater resources primarily because of the abundance of surface water in the region.³⁶ Today, no formal agreement exists between the two nations directly addressing transboundary groundwater resources along the common border. Nonetheless, a number of agreements at various levels of government are relevant to transboundary aquifers.

A. Canada-US Agreements

The first in a series of treaties relating to boundary waters between Canada and the United States, the 1909 Treaty between the United States and Great Britain Relating to Boundary Waters and Questions Arising between the United States and Canada provides the principles and mechanisms for preventing and resolving disputes over water quality and quantity along the Canadian-US boundary (Boundary Waters Treaty).³⁷ To achieve these goals, the treaty establishes the International Joint Commission (IJC), an independent bi-national organization created to prevent and resolve disputes relating to the use and quality of boundary waters along the Canadian-US border.³⁸

Although groundwater is not directly mentioned in the treaty, Article IV prohibits both countries from allowing ‘boundary waters and waters flowing across the boundary [to] be polluted on either side to the injury of health or property on the other.’³⁹ While the definition of ‘boundary waters’ limits the term to surface waters, the article appears to contemplate other types of flowing waters. Nevertheless, the Canadian government, through their

³⁵ *Ibid.* at sec. 6.

³⁶ A. Rivera, *Trans-Boundary Water in Canada*, paper presented at the thirty-third International Association of Hydrogeologists Congress, Zacatecas, Mexico, 11–15 October 2004 [on file with author].

³⁷ Treaty between the United States and Great Britain Relating to Boundary Waters, and Questions Arising between the United States and Canada (11 January 1909), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Boundary Waters Treaty].

³⁸ *Ibid.*, Articles. 3, 7, 8, 9, and 10. ³⁹ *Ibid.* at 4.

embassy in Washington, DC, has explicitly indicated that they do not interpret the treaty as encompassing groundwater resources.⁴⁰

Groundwater, however, is considered in the Great Lake Water Quality Agreement (Great Lake Agreement), which was signed under the auspices of the IJC on 22 November 1978.⁴¹ Although predominantly a surface water agreement, a number of the provisions refer to groundwater both expressly and impliedly. For example, Article VI(q) of the Great Lake Agreement, which is entitled 'Programs and Other Measures,' provides express reference to groundwater by requiring the parties to 'develop and implement programs and other measures to fulfill the purpose of [the] agreement,' including formulating 'programs for the assessment and control of contaminated *groundwater and subsurface sources* entering' the waters subject to the jurisdiction of the IJC.⁴² Annex 16 to the treaty, entitled 'Pollution from Contaminated Groundwater,' provides additional details on the specifics of the program, including identifying existing and potential sources of contaminated groundwater; mapping hydrogeological conditions of groundwater; developing a standard approach and procedure for sampling and analyzing groundwater to assess contamination and estimate contaminant loading from groundwater to the Great Lakes; and controlling contamination.⁴³ In addition, while not an explicit reference, Article 1 of the Great Lake Agreement offers a definition for the 'Great Lakes System,' which reasonably can be interpreted to encompass related groundwaters. Article 1 defines the term as all 'streams, rivers, lakes and other bodies of water that are within the drainage basin on the St. Lawrence River.'⁴⁴ While the focus of the Great Lake Agreement is on the surface waters of the Great Lakes, the language of the agreement provides both explicit and implicit obligations with regard to groundwater related to the Great Lakes that could impact the lakes through pollution.

B. Great Lakes Charter and Its Progeny

On 11 February 1985, two Canadian provinces (Ontario and Quebec) and eight US states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin) signed the Great Lakes Charter: Principles for the Management of Great Lakes Water Resources (Great Lakes

⁴⁰ Website of the Canadian Embassy in Washington, DC, <http://geo.international.gc.ca/can-am/washington/shared_env/q_a-en.asp> at Q12 (providing questions and answers on 'An Act to Amend the International Boundary Waters Treaty Act').

⁴¹ Great Lakes Water Quality Agreement between the U.S. and Canada (22 November 1978), 30 U.S.T. 1384, <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>.

⁴² *Ibid.*, Article VI(q) [emphasis added].

⁴³ *Ibid.* at Annex 16. ⁴⁴ *Ibid.*, Article 1.

Charter).⁴⁵ While not legally binding, the Great Lakes Charter establishes a basis for the cooperative management of the Great Lakes founded on an understanding that the Great Lakes Basin should be ‘recognized and treated as a single hydrologic system’ and ‘the natural resources and ecosystem of the Basin should be considered as a unified whole.’ Significantly, it explicitly recognizes groundwater as an integral component of the Great Lakes Basin and encourages the parties to consider groundwater resources in all activities related to the basin. Moreover, it defines ‘withdrawal’ from the basin as ‘the removal or taking of water from surface or *groundwater*.’⁴⁶

The Great Lakes Charter commits all of the parties to cooperate at all levels of government to ‘the study, monitoring, planning, and conservation of the water resources of the Great Lakes Basin.’ It emphasizes that the parties’ ‘shared responsibility to conserve and protect the water resources of the Great Lakes Basin for the use, benefit, and enjoyment of all their citizens’ and urges them to implement appropriate legislation. Moreover, it recognizes the intent of the parties to notify and consult all relevant provinces and states prior to approving a permit or major new or increased diversion or consumptive use of Great Lakes waters. Finally, the Great Lakes Charter commits the parties to develop and exchange data and information, to coordinate relevant research efforts, and, more specifically, to generate an inventory of the basin’s surface and groundwater resources.⁴⁷

In the late 1990s, a process was initiated to strengthen the objectives of the Great Lakes Charter culminating in the Great Lakes Charter Annex, A Supplementary Agreement to the Great Lakes Charter (Annex 2001).⁴⁸ While also non-binding, the Annex 2001 commits the parties to develop a basin-wide binding arrangement based on a broad-based public participation program, the goal of which is to ‘protect, conserve, restore, improve, and manage [the] use of the Waters and Water-Dependent Natural Resources of the Great Lakes Basin.’⁴⁹

The result of the Annex 2001’s commitments was the Great Lakes–St. Lawrence River Basin Sustainable Water Resources Agreement (Great Lakes Agreement), which was signed by the governors of the eight US states and the premiers of the two Canadian provinces on 13 December 2005.⁵⁰ The agreement establishes a ‘Decision Making Standard for Management

⁴⁵ Council of Great Lakes Governors, Great Lakes Charter: Principles for the Management of Great Lakes Water Resources (11 February 1985), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Great Lakes Charter].

⁴⁶ *Ibid.* ⁴⁷ *Ibid.*

⁴⁸ Council of Great Lakes Governors, Great Lakes Charter Annex, A Supplementary Agreement to the Great Lakes Charter (18 June 2001), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>.

⁴⁹ *Ibid.*

⁵⁰ Great Lakes–St. Lawrence River Basin Sustainable Water Resources Agreement (13 December 2005), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Great Lakes Agreement].

of Withdrawals and Consumptive Uses,' which is applicable to new water withdrawals and to increases to existing withdrawals over a set minimum volume.⁵¹ Furthermore, it also strengthens the collection and sharing of technical data among the states and provinces and requires that the parties submit their water management programs implementing the compact for periodic review.⁵²

Significantly, the Great Lakes Agreement directly encompasses groundwater resources within its scope. It defines 'water' as 'ground or surface water contained within the [Great Lakes–St. Lawrence River] basin' and defines 'waters of the basin or basin water' as 'the Great Lakes and all streams, rivers, lakes, connecting channels and other bodies of water, *including tributary groundwater*, within the Basin.⁵³ Under the agreement, though, the basin's surface water divide is used 'for the purpose of managing and regulating new or increased diversions, consumptive uses or withdrawals of... groundwater.'⁵⁴

While the Great Lakes Agreement is not intended to become a treaty and is not pursued at the national levels, the signatories have indicated their strong commitment to its terms. The Quebec national assembly has approved the agreement, while Ontario has actually incorporated the agreement into its domestic laws.⁵⁵ On the US side, the eight Great Lakes states are currently pursuing a parallel initiative—the Great Lakes–St. Lawrence River Basin Water Resources Compact (Great Lakes Compact)⁵⁶—which incorporates and would make the Great Lakes Agreement binding on the states.⁵⁷ As of 3 July 2008, Pennsylvania became the final Great Lakes state to sign the compact.⁵⁸ All that remains for it to enter into force is for the US Congress to review and approve the arrangement in accordance with its responsibility under the US Constitution.⁵⁹

⁵¹ *Ibid.* at sec. 4.10 and 4.11. ⁵² See *ibid.* at sec. 1.3(2)(e) and 3.4.

⁵³ *Ibid.*, Article 103 [emphasis added].

⁵⁴ *Ibid.*, Article 207.

⁵⁵ See Implementation, Great Lakes–St. Lawrence River Water Resources Regional Body website, <<http://www.glsrregionalbody.org/AgreementImplementationStatus.aspx>> [Implementation].

⁵⁶ Council of Great Lakes Governors, The Great Lakes–St. Lawrence River Basin Water Resources Compact (13 December 2005), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Great Lakes Compact].

⁵⁷ See Implementation, *supra* note 55.

⁵⁸ See *PA on Course to OK Pact to Protect Great Lakes*, Chicago Tribune, 3 July 2008, <<http://www.chicagotribune.com/news/chi-ap-pa-xgr-greatlakescom,0,5648987.story>>; see also Implementation, *supra* note 55.

⁵⁹ Under the US Constitution, a compact between US states must be approved by the US Congress before it can enter into force. Once congressional approval is obtained, a compact carries the force of federal US law. US Const. art. 1 § 10, Clause 3. For additional discussion pertaining to compacts between US states addressing transboundary groundwater resources, see notes 66–83 in this article and accompanying text.

C. Arrangements between the Canadian Province of British Columbia and the US State of Washington

Several regional arrangements are found along the US-Canadian border. One is the 1992 Environmental Cooperation Agreement between the Province of British Columbia and the State of Washington (British Columbia-Washington Agreement), which created the British Columbia-Washington Environmental Initiative and established the British Columbia-Washington Environmental Cooperation Council (British Columbia-Washington Council).⁶⁰ The British Columbia-Washington Agreement calls for regular meetings and the creation of subcommittees as necessary and includes a number of work priorities and preliminary action plans. The Abbotsford-Sumas Aquifer, which is located along the US-Canada border, was one of the listed priorities requiring immediate joint action.

At the first meeting of the British Columbia-Washington Council, the council created the Abbotsford-Sumas Aquifer International Task Force to respond to, and address, the identified issues.⁶¹ This taskforce, consisting of representatives from federal and provincial agencies from both countries, has mainly focused on issues related to water quality in the aquifer. The main objectives of the taskforce are to develop a joint groundwater management plan; coordinate efforts aimed at protecting the aquifer; develop aquifer management strategies using a managerial approach; and facilitate and coordinate education and public involvement in water management issues.

In response to the concern for the Abbotsford-Sumas Aquifer, British Columbia and the State of Washington signed in 1996 the Memorandum of Agreement Related to Referral of Water Right Applications (Abbotsford-Sumas MOA).⁶² The arrangement addresses the referral of water rights applications 'within or on the exterior boundaries' of the Abbotsford-Sumas Aquifer on both sides of the border. It defines the roles and responsibilities of the relevant permitting agencies to allow timely prior consultation, comment period, and exchange of information on water quantity allocations within each party's territory, which 'could potentially significantly impact water quantity on the other side of the border.' It also provides for the

⁶⁰ Environmental Cooperation Agreement between the Province of British Columbia and the State of Washington and British Columbia (17 May 1992), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [British Columbia-Washington Agreement].

⁶¹ Summary of 1 October 1992 meeting of the British Columbia-Washington Environmental Cooperation Council, <http://www.env.gov.bc.ca/spd/ecc/docs/borderline_news/meeting92.pdf>.

⁶² Memorandum of Agreement Related to Referral of Water Right Applications between the State of Washington as represented by the Department of Ecology and the Province of British Columbia as represented by the Minister of Environment, Lands and Parks, 10 October 1996, <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Abbotsford-Sumas MOA].

sharing of studies addressing water availability and the development of water resources within or on the boundaries of the aquifer. The Abbotsford-Sumas MOA specifically applies to all surface water, groundwater, and reservoir waters.

A third arrangement in this region is the 1995 Interagency Memorandum of Understanding between the State of Washington Department of Ecology Eastern Regional Office and the Province of British Columbia Ministry of Environment, Lands and Parks Kootenay Region (Columbia River MOU).⁶³ This arrangement was designed to 'assure continued coordination and cooperation relative to major environmental issues within the international portion of the Columbia River drainage.'⁶⁴ While the Columbia River MOU only mentions groundwater in the scope of work attached to the document, and only with regard to discharges of effluent, groundwater is implicated in the Columbia River MOU inasmuch as it is part of the Columbia River drainage basin. The MOU obligates the parties to: (1) provide timely prior notification of proposed discharges with potential for cross border water quality impacts; (2) 'provide an opportunity for comment on planning activities that may have trans-boundary impacts'; (3) share environmental data from the international portion of the Columbia River drainage system; (4) provide the opportunity to review and comment on projects or activities with potential to cause cross border impacts; (5) 'facilitate public information sharing meeting'; and (6) specify contacts to facilitate the timely sharing of information.⁶⁵

3. Transboundary Arrangements within the United States

A. Interstate Compacts

Interstate compacts are the preferred method for resolving transboundary water disputes in the United States. Compacts are like treaties in the sense that two sovereign states enter into an agreement over a transboundary resource. All interstate compacts in the United States require approval by the US Congress.⁶⁶ In the United States, twenty-six water allocation compacts are in force, at least four of which include the federal government as a signatory.⁶⁷ While no interstate compacts focus exclusively on a transboundary aquifer, a number of the allocation compacts do address interrelated groundwater resources. These include the

⁶³ Interagency Memorandum of Understanding between the State of Washington Department of Ecology Eastern Regional Office and the Province of British Columbia Ministry of Environment, Lands and Parks Kootenay Region (1995), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Columbia River MOU].

⁶⁴ *Ibid.* ⁶⁵ *Ibid.*

⁶⁶ U.S. Constitution, Art. 1, para. 10, Clause 3.

⁶⁷ J. Muyes, G.W. Sherk, and M.C. O'Leary, *Utton Transboundary Resources Center Model Interstate Water Compact* 47 Nat. Res. J. 17 at 21 (2007).

yet-to-be-approved Great Lakes Compact discussed earlier⁶⁸ as well as the following arrangements.

The Susquehanna River Basin Compact, which was adopted in 1968 by New York, Maryland, Pennsylvania, and the United States,⁶⁹ is one of the few interstate compacts that treat groundwater equally with surface water in terms of planning, allocation, and regulation of water use. The 1968 compact defines 'waters' as meaning both surface and ground waters within the drainage area of the Susquehanna River. It states in Article 1.3 that '[t]he water resources of the basin are functionally interrelated, and the uses of these resources are interdependent' and, therefore, '[a] single administrative agency is... essential for effective and economical direction, supervision, and coordination of water resources efforts and programs.'⁷⁰

The 1968 compact also created a commission to assist in implementing the goals of the compact. Commission approval is required for all transboundary water projects; projects involving diversions of water into or from the basin; projects that may have a 'significant effect' on the water resources of another state party; and projects that are included within the scope of the commission's comprehensive plan for the development of water resources or that would have a 'significant effect' on the commission's plan. Towards these objectives, the parties agree to 'seek enactment of such additional legislation as will be required to enable' the commission to accomplish its obligations and duties.⁷¹

In the western United States, Colorado, Kansas, and Nebraska entered into the Republican River Compact in 1943.⁷² This compact allocates the average annual water supply of the Republican River to each state in specific proportions.⁷³ In 1998, Kansas filed a complaint before the US Supreme Court alleging that Nebraska had violated the compact by allowing private well owners to pump groundwater hydraulically connected to the Republican River and its tributaries.⁷⁴ Kansas claimed Nebraska was using more water than its allocation under the compact, thus depriving Kansas of its full entitlement. Colorado was joined in the lawsuit because it is a party to the compact and the headwaters of the Republican River rise within Colorado.⁷⁵

⁶⁸ See Great Lakes Compact, *supra* note 56 and accompanying text.

⁶⁹ Susquehanna River Basin Compact, Pub. L. No. 91-575, 84 Stat. 1509 (24 December 1970), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Susquehanna River Basin Compact].

⁷⁰ *Ibid.* ⁷¹ *Ibid.*

⁷² Republican River Compact, Pub. L. No. 78-60, 57 Stat. 86 (1943), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Republican River Compact].

⁷³ *Ibid.*

⁷⁴ John Hanna, *Kansas Demands Nebraska Cut Use of Water from River and Pay Damages* (20 December 2007), <<http://climate.weather.com/articles/water122007.html>>.

⁷⁵ *Ibid.*

Following protracted negotiations, the three states entered into a settlement agreement. Among other things, the states agreed to include in the count of each state's allocation groundwater withdrawals that are determined to deplete stream flow in the Republican River or its tributaries.⁷⁶ The states also agreed: (1) to cooperate on developing a comprehensive groundwater model; (2) to a moratorium on groundwater development in the basin upstream of Guide Rock, Nebraska; (3) on a methodology for determining 'Virgin Water Supply, Computed Water Supply, Allocations, Imported Water Supply Credit, augmentation credit and Computed Beneficial Consumptive Use'; (4) on a process for developing a groundwater model for the basin; and (5) on a dispute resolution process.⁷⁷

Unlike the Republican River Compact, which allocated water in proportions, the Arkansas River Compact, signed in 1948 by the states of Colorado and Kansas, equally allocates the waters of the Arkansas River and their utilization between the two states.⁷⁸ It also equally allocates the benefits arising from the construction, operation, and maintenance of the then-planned John Martin Reservoir. Article IV-D of the compact provides that all future development of the Arkansas River Basin must not materially deplete the usable quantity or availability of water in the river to other users of the river's waters.⁷⁹ In 2001, the US Supreme Court interpreted this provision to include the development of groundwater resources within the basin.⁸⁰

The Upper Niobrara River Compact, which was signed in 1962 by the states of Wyoming and Nebraska, was principally designed to apportion equitably the surface waters of the Upper Niobrara River Basin.⁸¹ However, the compact also acknowledges that groundwater could become an important source of irrigation water, and, therefore, it established a secondary objective of compiling and assessing information on 'groundwater and underground water flow' that would assist in the future apportionment of such waters.⁸² According to Article VI(a) of the compact, groundwater would not be apportioned 'until such time as adequate data [sic] on groundwater of the basin are available.' Articles VI further provides that to obtain the necessary data, the two states shall cooperate and shall bear all costs equally.⁸³

⁷⁶ *Ibid.*

⁷⁷ *Kansas v. Nebraska and Colorado*, 538 U.S. 720 (2003) (order approving the final settlement stipulation).

⁷⁸ Arkansas River Compact, Pub. L. No. 81-82, 63 Stat. 145 (1949), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Arkansas River Compact].

⁷⁹ *Ibid.*, Article IV-D.

⁸⁰ *Kansas v. Colorado*, 121 S.Ct. 2023 (2001).

⁸¹ Upper Niobrara River Compact, Pub. L. No. 91-52, 83 Stat. 86 (1969), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Upper Niobrara River Compact].

⁸² *Ibid.*, Article I(a). ⁸³ *Ibid.*

*B. Congressional Mandate: The Truckee-Carson-Pyramid Lake Water Settlement Act (Truckee-Carson Act)*⁸⁴

The Truckee River Basin, located in California and Nevada, has been a source of contention for nearly a century. Demand for the waters of this basin has often been greater than its supply. As a result, beginning in 1935 with the first Truckee River Agreement, various arrangements were devised to allocate the waters of the basin.⁸⁵ In 1990, the US Congress enacted the Truckee-Carson Act, which equitably allocates the waters of the Truckee River, Lake Tahoe, and the Carson River between the two states.⁸⁶ Although the act primarily focuses on surface water, it recognizes the interrelated nature of surface and groundwater.

Section 204(a)(5) of the Truckee-Carson Act ensures that both states, individually or collectively, can study the use of surface water to enable the conjunctive use of groundwater. Sections 204(b)(1) and 204(c)(1) include groundwater in the computation of allowable diversions from Lake Tahoe and the Truckee River, respectively. Moreover, the Act recognizes groundwater as an integral source of freshwater and prioritizes groundwater use based on the location of extraction. For example, under section 204(c)(1)(C), any use of groundwater in Nevada, which is extracted from groundwater related to the Truckee River in California, is subordinate to existing and future uses of groundwater in California.⁸⁷

In addition, the Truckee-Carson Act establishes a 'safe yield' standard in the management of groundwater interrelated to the Truckee River Basin. In section 204(c)(1)(C), the act provides that any use of groundwater in Nevada shall cease to the extent that it causes extractions to exceed the safe yield as determined by the United States Geological Survey and California law.⁸⁸ Furthermore, the Truckee-Carson Act, under section 210(b)(16), requires the secretary of the US Department of the Interior to 'undertake appropriate measures to address significant adverse impacts' on domestic uses of groundwater that result directly from the water purchases by the Act.⁸⁹ Such measures must be in consultation with officials from the state of Nevada and 'affected local interests.' The provisions of this Act are to be implemented by a Truckee River Operating Agreement, which is being developed by the

⁸⁴ The Truckee-Carson-Pyramid Lake Water Settlement Act, Pub. L. No. 101-618 (S 3048) (1990), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Truckee-Carson Act].

⁸⁵ See Truckee River Agreement (13 June 1935), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>; see also J. Kramer, *Lake Tahoe, the Truckee River, and Pyramid Lake: the Past, Present, and Future of Interstate Water Issues* 19 Pacific L.J. 1339 (1988).

⁸⁶ Truckee-Carson Act, *supra* note 84.

⁸⁷ *Ibid.* at sec. 204. ⁸⁸ *Ibid.* at sec. 210.

⁸⁹ *Ibid.*

US Department of the Interior and the California Department of Water Resources.⁹⁰

C. General Arrangements between US States

Another source of cooperation is that pursued between subnational states. In the United States, these are unofficial arrangements with no legal implications because they lack congressional approval.⁹¹ Nonetheless, such arrangements are similar to those between subnational units in international transboundary scenarios.⁹² For example, the Pullman-Moscow Aquifer Inter-Agency Agreement between the States of Washington and Idaho was adopted by the Washington Department of Ecology and the Idaho Department of Water Resources to promote coordination on the management of the Palouse Basin Aquifer (Palouse Basin Agreement).⁹³ Entered into on 18 April 1992, this arrangement formalizes the role of the previously organized Palouse Basin Aquifer Committee (PBAC) in managing the Palouse Basin Aquifer.⁹⁴ The PBAC has developed a coordinated groundwater management plan that sets goals and action plans for the improved management of the aquifer. The present arrangement requires the states to share information on new groundwater allocation permits as well as changes to old permits and requires that decisions on such requests be guided by the PBAC's groundwater management plan. While final authorization remains with the respective state agencies, the arrangement also requires that all new permits and proposed change-of-permit applications be submitted to the PBAC for review, evaluation, and recommendation.

Another interstate groundwater arrangement is the Memorandum of Agreement for Maintenance and Utilization of the Numerical Model of the Spokane Valley-Rathdrum Prairie Aquifer between Idaho Department of Water Resources and Washington Department of Ecology (SVRP MOA).⁹⁵ The SVRP MOA offers guidance on how the two states will cooperate on water supply issues in the Spokane Valley-Rathdrum Prairie Aquifer. It is

⁹⁰ Federal Register, 10 November 2004 (Volume 69, Number 217). The Federal Register indicates that the public comments period for the draft agreement closed on 30 December 2004.

⁹¹ See note 66 and accompanying text.

⁹² See, for example, Juárez-El Paso MOU, *supra* note 25 and accompanying text.

⁹³ Pullman-Moscow Aquifer Inter-Agency Agreement between the States of Washington and Idaho (18 April 1992), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>. The Palouse Basin Aquifer was formerly identified as the Pullman-Moscow Water Resources Committee. More information on this aquifer can be found at <<http://www.webs.uidaho.edu/pbac/>> [Palouse Basin Agreement].

⁹⁴ *Ibid.*

⁹⁵ Memorandum of Agreement for Maintenance and Utilization of the Numerical Model of the Spokane Valley-Rathdrum Prairie Aquifer between Idaho Department of Water Resources and Washington Department of Ecology (8 October 2007), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [SVRP MOA].

based on a jointly developed computer model for groundwater flow that permits water managers on both sides of the border to enter data about a proposed withdrawal and determine whether the withdrawal would affect regional water levels.⁹⁶ Of note, the MOA establishes a collaborative 'modeling committee' of experts from both states who are assigned the responsibility of managing and securing the computer model and ensuring that all updates are agreed upon by both sides. The committee also assesses proposed enhancements to the model as well as the direction of research intended to enhance the model.⁹⁷

Along the Atlantic coast, the Georgia Environmental Protection Division (GA-EPD) and the South Carolina Department of Health and Environmental Control (SC-DHEC) entered into the Letter Agreement between the Georgia Environmental Protection Division, Department of Natural Resources and the South Carolina Department of Health and Environmental Control (Georgia-South Carolina Letter Agreement) regarding salt-water encroachment in the Hilton Head-Savannah border area on 25 October 1995.⁹⁸ The agreement details a ten-year program to develop a joint strategy for addressing groundwater quality and quantity problems in the Floridian Aquifer, which traverses the border of the two states. The Letter Agreement indicates that Georgia would develop a groundwater management strategy and undertake certain groundwater conservation measures to complement similar activities already in place in South Carolina. It also indicates that the states agree on reducing withdrawals in specific locations on both sides of the border as a means to address groundwater quality and quantity issues.⁹⁹

While the initial arrangement was set for ten years, the states have continued their cooperative efforts in the context of Georgia's Coastal Sound Science Initiative (CSSI)¹⁰⁰ and have worked with the US Geological Survey to model the region's groundwater resources in an effort to determine how best to manage them. In a related matter, the governors of the two states created in June 2005 a bi-state Savannah River Committee as a forum for discussing issues of mutual interest related to the waters of the Savannah River Basin.¹⁰¹ While the two governors' executive orders

⁹⁶ *Ibid.* ⁹⁷ *Ibid.*

⁹⁸ Letter Agreement between the Georgia Environmental Protection Division, Department of Natural Resources, and the South Carolina Department of Health and Environmental Control (letter from Georgia dated 29 June 1995, and from South Carolina dated 25 October 1995), <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>> [Georgia-South Carolina Letter Agreement].

⁹⁹ *Ibid.*

¹⁰⁰ See US General Attorney, Coastal Georgia Sound Science Initiative: Evaluation of ground-water flow, saltwater contamination and alternative water sources, <<http://ga2.er.usgs.gov/coastal/>>.

¹⁰¹ Governor Sonny Perdue, Executive Order on the Creation of the Governor's Savannah River Committee of Georgia, signed 21 June 2005, <<http://www.internationalwaterlaw.org/>>

creating the committees do not mention groundwater specifically, the actions of the committee clearly indicate that groundwater is an important component of the effort. In October 2007, under the auspices of the committee, representatives of both the GA-EPD and SC-DHEC entered into a memorandum of agreement whose goal is to refine the CSSI mathematical model and implement it as a means of preventing salt-water intrusion into the Floridian Aquifer.¹⁰² The Memorandum of Agreement between the South Carolina Department of Health and Environmental Control and the Georgia Environmental Protection Division creates a Technical Advisory Committee, composed of representatives of the two agencies and the US Geological Survey, which is tasked with reviewing and critiquing the model and identifying new scenarios for the management of the aquifer.¹⁰³

D. Court Decisions

The North Platt River Settlement Decree of 2001 (2001 Decree) was imposed by the US Supreme Court on the states of Colorado, Nebraska, and Wyoming.¹⁰⁴ The 2001 Decree resulted from the latest in a series of lawsuits between the three states over the waters of the North Platt River. In 1945, in its first decree related to the dispute (1945 Decree), the US Supreme Court equitably apportioned the North Platte River among Colorado, Nebraska, and Wyoming.¹⁰⁵ In 1986, Nebraska sued Wyoming, claiming that the latter was unlawfully depleting the waters of the North Platt River in contravention of the 1945 Decree.¹⁰⁶

The 1945 Decree focuses exclusively on surface water. This decree, however, recognizes that reservoirs on the North Platte River could lose some water as a result of ‘ground absorption and storage.’¹⁰⁷ Moreover, the 1945 Decree acknowledges that ‘seepage’ was the property of the appropriator even though the water originated from a surface source and may have previously been used.¹⁰⁸ In sharp contrast, the 2001 Decree explicitly recognizes that surface and groundwater resources may be hydraulically related and, albeit implicitly, that hydraulically related water resources should

Local-GW-Arrangements.html>; Governor mark Sanford, Executive Order on the Creation of the Governor’s Savannah River Committee of South Carolina, no. 2005–14, signed 21 June 2005, <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>.

¹⁰² Memorandum of Agreement between the South Carolina Department of Health and Environmental Control and the Georgia Environmental Protection Division, signed 15 October 2007, <<http://www.internationalwaterlaw.org/Local-GW-Arrangements.html>>.

¹⁰³ See US Geological Survey Project Guide Lines: Simulation of Water Levels, Saltwater Intrusion, and Water Management Scenarios in the Savannah-Hilton Head Island Area—Project Period June 2007-March 2009, at 3 (2007) [on file with author].

¹⁰⁴ *Nebraska v. Wyoming*, 534 U.S. 40 (2001).

¹⁰⁵ *Nebraska v. Wyoming*, 325 U.S. 589 (1945) as modified by the court in *Nebraska v. Wyoming*, 345 U.S. 981 (1953).

¹⁰⁶ *Nebraska v. Wyoming*, 479 U.S. 1051 (1987).

¹⁰⁷ *Nebraska v. Wyoming*, 325 U.S. 589 (1945).

¹⁰⁸ *Ibid.*

be managed comprehensively. For example, the 2001 Decree enjoins the state of Wyoming from diverting water for irrigation purposes from the North Platte River 'and its tributaries, including water from hydrologically connected groundwater wells.' It further notes that the consumptive use of irrigation water encompassed under this injunction 'shall include... [w]ater consumed for irrigation purposes on lands irrigated by water from hydrologically connected groundwater wells.'¹⁰⁹

III. EMERGING STATE PRACTICE?

Although the water resources from the above arrangements range dramatically in location, geology, and use, it is possible to discern a number of normative commonalities that appear applicable regardless of geography or local conditions. These include such areas as cooperation, data and information sharing, joint monitoring, public participation, and a preference for subsidiarity and for developing local solutions for local issues. To the extent that the appearance of these principles in the various instruments constitutes a trend, they may evidence emerging state practice.

1. Cooperation

One of the most important factors that can determine the success of an arrangement cannot be found in the text. A large part of water issues are political. Therefore, the non-tangible goals and attitudes of the parties and the manner in which they approach the negotiations are vital parts of the process.¹¹⁰ The arrangement needs to be flexible enough to deal with different situations surrounding shared groundwater but specific enough to demand the cooperation necessary.¹¹¹ Some form of cooperation is explicitly present in almost every one of the earlier listed arrangements. The presence of an agreement, formal or informal, indicates at least an implicit measure of cooperation among the parties. Cooperation can be applied to a variety of groundwater-related issues ranging from the research of a resource to the management and development and even the protection of an aquifer. It can require a party to recognize that more than one entity has a right to a water resource as well as acknowledge the role of water in different cultures and its importance in spirituality and creating a sense of place.

This obligation is often written as a reflection of the overall purpose of the arrangement. All of the United States-Mexico arrangements have a cooperation component related to the use of the particular aquifer as well as the limits on withdrawal. For example, Minute 242 obligates both parties

¹⁰⁹ *Nebraska v. Wyoming*, 534 U.S. 40 (2001).

¹¹⁰ V. Bennett and L.A. Herzog, *U.S.-Mexico Borderland Water Conflicts and Institutional Change: A Commentary* 40 Nat. Resources J. 973 at 976 (2000).

¹¹¹ D.A. Caponera and D. Alheritiere, *Principles for International Groundwater Law* 18 Nat. Resources J. 589 at 591 (1978).

to restrict groundwater withdrawal on both sides of the border within five miles of the Arizona-Sonora boundary near San Luis,¹¹² while the Juárez-El Paso MOU obligates the cities of Juárez and El Paso to develop and coordinate a compatible plan ‘to secure water supplies and extend the life of the Hueco Bolson.’¹¹³ In contrast, along the US-Canada border, cooperation appears to be equally concerned with water quality and quantity. For example, the 1909 Boundary Waters Treaty, the 1995 Columbia River MOU, the 2005 Great Lakes Agreement, and the 2005 Great Lakes Compact include cooperation requirements related to both groundwater quantity and quality issues.¹¹⁴

At times, the type of cooperation required appears to be more basic. In the case of the Great Lakes Charter, the parties agree to cooperate in defining, studying, and managing the resource.¹¹⁵ The 1992 British Columbia-Washington Agreement requires cooperation in meeting regularly and coordinating actions in response to shared concerns.¹¹⁶ In other cases, the obligation to cooperate is implicit. Neither the Georgia-South Carolina Letter Agreement nor the Georgia-South Carolina MOA explicitly mandate cooperation between the parties. Yet, the two arrangements are built on the understanding that they must cooperate if they are to accomplish their objectives.¹¹⁷

Whether or not an arrangement explicitly specifies cooperation, it is a critical part of any successful accord to share a resource. In its absence, other objectives will be difficult, if not impossible, to achieve. Although

¹¹² Minute 242, *supra* note 20 at para. 5.

¹¹³ Juárez-El Paso MOU, *supra* note 25 at para. 3(e).

¹¹⁴ Boundary Waters Treaty, *supra* note 37 (discussing International Joint Commission approval of future diversions and other activities with possible transboundary affect in Articles III and IV, cooperation on Niagara River water levels above the falls in Article V, and cooperation in the apportionment of the St. Mary and Milk Rivers and their tributaries in Article VI; also discussing an agreement not to cause pollution resulting in injury of health or property to the other party in Article IV); 1995 Columbia River MOU, *supra* note 63 (recognizing in the MOU and Article III(a) and (b) of Attachment 1 to the MOU that the parties ‘mutually agree to’ cooperate over new discharges and consumptive uses); 2005 Great Lakes Agreement, *supra* note 50 (specifying the agreed-upon requirements on existing and new diversions and withdrawals in Articles 200–3 and 205 and those relating to water quality in Articles 201 and 203); 2005 Great Lakes Compact, *supra* note 56 (regulating diversions and withdrawals in Articles 4.8–4.11 and 4.14; creating an inventory of water data related to existing quantities and proposed withdrawals, diversions and consumptive uses, as well as reporting requirements for certain withdrawals, diversions and consumptive uses in Article 4.1, and describing water conservation and efficiency requirements in Article 4.2; imposing some criteria on water quality in Article 4.9 for water returned or introduced into the basin, and conditioning withdrawals on ensuring remaining water quality in Article 4.11).

¹¹⁵ 1985 Great Lakes Charter, *supra* note 45 (providing in Principle II that the parties ‘recognize and commit to a spirit of cooperation... in the study, monitoring, planning, and conservation of the water resources of the Great Lakes Basin’).

¹¹⁶ 1992 British Columbia-Washington Agreement, *supra* note 60, at attached terms of reference and preliminary action plan/work priorities.

¹¹⁷ See generally notes 98–103 in this article and accompanying text.

working together is a necessary component of any successful arrangement, sometimes more proactive obligations must also be present.

2. Prior Notification of Planned Activities

A logical extension of cooperation is advance notification of activity by one party that may adversely affect the other parties who share the water source.¹¹⁸ Within this requirement is a range of compliance alternatives. Some of the arrangements reviewed require mere notification of the activity, while others impose more stringent criteria and require additional procedures for informing another state of planned activities.

Minute 242 is an example of the most basic consultation arrangement simply requiring the parties in paragraph 6 to consult each other prior to new development of water resources or any action that would adversely impact the other party.¹¹⁹ The Great Lakes Charter offers more detailed obligations in the section on implementation of principles and consultation procedures by requiring notification of all relevant provinces and states prior to 'any new or increased diversion or consumptive use' in excess of 5,000,000 gallons and specifies opportunities for objecting to, and consulting over, such proposals.¹²⁰ Its progeny, the 2005 Great Lakes Agreement also calls for prior notice and commenting opportunities in Article 205 for certain new and increase-in-use applications.¹²¹ In the case of the Abbotsford-Sumas MOA, the arrangement calls on the relevant permitting agencies to provide a comment period to their counterparts across the border before approving a water quantity allocation.¹²² In a somewhat different approach, the 1995 Columbia River MOU allows for timely consultation but, unlike the other arrangements, also incorporates an opportunity for 'transboundary public comment.'¹²³

3. Sharing of Data and Information

In order to protect a resource, it must first be understood. The realization that a shared water arrangement is necessary often predates the full understanding of the resource. For this reason, a common aspect of state practice involves the sharing of data and information between users of a

¹¹⁸ This and many of the other principles discussed in this article are well recognized in the international law of transboundary resources, which lends support to their application in the context of shared groundwater resources.

¹¹⁹ Minute 242, *supra* note 20, at para. 6.

¹²⁰ 1985 Great Lakes Charter, *supra* note 45 at 'Implementation of Principles: Consultation Procedures.'

¹²¹ 2005 Great Lakes Agreement, *supra* note 50.

¹²² Abbotsford-Sumas MOA, *supra* note 62, at sec. 2 on Scope of Work attached to the MOA.

¹²³ 1995 Columbia River MOU, *supra* note 63 (requiring in the MOU for timely notification and commenting opportunities for proposed new discharges as well as for proposed new consumptive uses as described in detail in Article III(a) and (b) of Attachment 1 to the MOU on Scope of Work).

shared water resource. Common data collection includes water quality testing, aquifer modeling, monitoring water table levels, and aquifer mapping. The particulars of what is incorporated into the data collection provision is dependent on local specifics, but its presence, in some form, is critical to continued understanding and prudent stewardship.

Data collection can be necessary to create specific use regulations or it can be part of ongoing operation and maintenance. An arrangement written in the early stages of resource development may be more expansive. In the Republican River Compact, three states agreed to the development of a comprehensive model of the relationship between aquifer withdrawals and the Republican River. In other locations, where research has already taken place, data collection may be less inclusive or specific. For example, in El Paso, Texas, the Hueco Bolson Aquifer has been heavily studied and modeled in an effort to gain accurate future water availability estimates. However, in the MOU between the local water utilities on either side of the border, both parties agree to share any newly gained information regarding transboundary water resources. To a limited extent, the US-Mexico Transboundary Aquifer Assessment Act contemplates expanding existing arrangements related to archiving and sharing relevant data.¹²⁴

Provisions for joint sharing of data and information also can be found in a number of arrangements focusing on the US-Canada border. The 1978 Great Lakes Water Quality Agreement includes a biennial meeting to share monitoring data provided by both parties. The 1985 Great Lakes Charter recognizes joint monitoring of the water resources in the second principle, which focuses on cooperation. This mandate is later expanded by a description of a joint database 'and the establishment of systematic arrangements for the exchange of water data and information.'¹²⁵ Unlike other arrangements, detailed information is provided about the form and type of data that must be supplied as part of monitoring efforts.

The Great Lakes Compact provides that a chief purpose of the compact is '[t]o facilitate the exchange of data, strengthen the scientific information base upon which decisions are made and engage in consultation on the potential effects of proposed Withdrawals and losses on the Waters and Water Dependent Natural Resources of the Basin.'¹²⁶ Similarly, parties to the Abbotsford-Sumas MOA must 'cooperate in sharing relevant water quantity information necessary to provide management of those water resources.'¹²⁷ The arrangement between the cities of El Paso and Ciudad

¹²⁴ See US-Mexico Transboundary Aquifer Assessment Act, *supra* note 31 at Article 4(b)(2)(B).

¹²⁵ Great Lakes Charter, *supra* note 45.

¹²⁶ Great Lakes Compact, *supra* note 56 at Article 1.3(2)(e).

¹²⁷ Abbotsford-Sumas MOA, *supra* note 62.

Juarez also recognizes the history of, and implicates the continued need for, shared technical information about the Hueco Bolson Aquifer.¹²⁸

4. Public Participation

The inclusion of the public is paramount to achieving success in any shared use arrangement. True participation means that no one is excluded from participation in the decision-making processes and institutions necessary for human survival and fulfilment, including those relating to water. 'Public involvement holds the promise of improving the management of international watercourses and reducing the potential for conflict over water issues.'¹²⁹ Participation improves the quality of decisions, facilitates the decision-making process, improves credibility, and enhances implementation.¹³⁰

A number of the documents reviewed explicitly list public participation as a condition of the arrangement. For example, the second directive of the Great Lakes Charter Annex specifically calls for the governors and premiers to commit to a process that ensures public input. The 1995 Columbia River MOU provides the public an 'opportunity to review and comment in writing or verbally on a proposal under consideration by the agency with jurisdiction.'¹³¹ The Georgia-South Carolina Letter Agreement is more specific, requiring public meetings and hearings to establish a 'Coastal Groundwater Management Strategy.'¹³² Public meetings with sufficient notice are also a condition of the Susquehanna River Basin Commission.¹³³

Often, some arrangements do not overtly call for public participation but, rather, incorporate public participation opportunities through other defined processes. For example, the Abbotsford-Sumas Aquifer has an active stakeholder group that includes concerned citizens as well as representatives from federal, provincial, and local government agencies.¹³⁴ The Truckee River has a comparable watershed council.¹³⁵ Domestic legal requirements can also promote participation by requiring public dissemination of proposed projects with opportunities for public comment. The SVRP MOA, for example, requires the Model Committee, which is organized by the Idaho Department of Water Resources in conjunction with the Washington Department of Ecology, to establish protocols and procedures for publicly

¹²⁸ Juárez-El Paso MOU, *supra* note 25.

¹²⁹ Carl Bruch et al., *From Theory to Practice: An Overview of Approaches to Involving the Public in International Watershed Management*, in Carl Bruch et al., eds., *Public Participation in the Governance of International Freshwater Resources*, 3 at 3 (2005).

¹³⁰ *Ibid.* at 6.

¹³¹ Columbia River MOU, *supra* note 63.

¹³² Georgia-South Carolina Letter Agreement, *supra* note 98.

¹³³ Susquehanna River Basin Compact, *supra* note 69, Article 15.4.

¹³⁴ Discover Abbotsford, <<http://www.abbotsford.ca/Page133.aspx>>.

¹³⁵ See Truckee River Watershed Council, <<http://www.truckeeriverwc.org/>>.

disseminating updated versions of the groundwater flow model of the Spokane Valley-Rathdrum Prairie Aquifer.¹³⁶ In addition, US interstate compacts adopted by US state legislatures, such as those on the Arkansas and Republican rivers, are subject to domestic state procedures, which typically include public hearings and comment opportunities. Although it is more effective to ensure participation by specifically including it in an arrangement, such secondary opportunities can still encourage involvement by interested stakeholders.

5. Subsidiarity

The principle of subsidiarity suggests that social decision making ought to be handled by the lowest level of competent authority.¹³⁷ It emphasizes a bottom-up approach and contends that those with the greatest interest in the resolution of a problem are best suited to respond to the problem.¹³⁸ In consequence, the principle reflects a presumption for a decentralization of decision making.¹³⁹ Accordingly, subsidiarity is justified on the grounds that ‘decentralized decisions generally, *but not always*, will be better informed, will better reflect the values and preferences of those affected, will be more adaptable to improving knowledge and changing circumstances, and will lead to better results in terms of maintaining a sustainable human environment.’¹⁴⁰ Another advantage relates to the degree of agility with which local officials can respond to a water challenge as compared to officials at higher and more distant levels of government.

While the nations of North America do not formally subscribe to the principle of subsidiarity by name, the concepts of federalism in all three countries do reflect significant deference to subnational decision-making bodies. As a result, a *de facto* system of subsidiarity arguably exists for addressing transboundary groundwater resources on the continent. The majority of the documents examined in this study evidence a pattern of local authorities tackling local groundwater challenges without involving the national governments of the respective nations. Significantly, such initiatives were taken at various levels of local and regional government. The Juárez-El Paso MOU, for example, represents an effort taken at the lowest political level—the public water utilities of El Paso and Ciudad Juárez—in an effort to address the challenges posed by the transboundary utilization of the

¹³⁶ See SVRP MOA, *supra* note 95 at 1(d).

¹³⁷ See R.K. Vischer, *Subsidiarity as a Principle of Governance: Beyond Devolution* 35 Ind. L. Rev. 103 at 142 (2001) (noting that ‘subsidiarity, at its core, envisions a society in which problems are solved and decisions made from the bottom up’); Paolo G. Carozza, *Subsidiarity as a Structural Principle of International Human Rights Law* 97 Am. J. Int’l L. 38 at 42 (2003).

¹³⁸ J.L. Huffman, *Making Environmental Regulations More Adaptive through Decentralization: The Case for Subsidiarity* 52 U. Kan. L. Rev. 1377 at 1381–2 (2004).

¹³⁹ *Ibid.* at 1381.

¹⁴⁰ *Ibid.* at 1378 [emphasis in original].

Hueco Bolson Aquifer.¹⁴¹ The British Columbia-Washington Agreement, the Abbotsford-Sumas MOA, and the Columbia River MOU also constitute examples of a *de facto* system of subsidiarity, albeit at a higher level of authority. All three arrangements were pursued and implemented at the state and province levels for the purpose of addressing transboundary groundwater resources along the border between Washington State and the province of British Columbia.¹⁴² The same can be said of the Great Lakes Charter and its progeny, the 2005 Great Lakes Agreement and 2005 Great Lakes Compact.¹⁴³

Within the United States, subsidiarity appears to be more officially sanctioned to the extent that the US Constitution reserves to the states all power and authority not delegated to the federal government or prohibited by the Constitution.¹⁴⁴ Thus, the various compacts between US states considered in this article represent more of a *de jure* system of subsidiarity, albeit with some national oversight in the guise of congressional approval.¹⁴⁵ To a similar extent, the Palouse Basin Agreement, the SVRP MOA, the Georgia-South Carolina Letter Agreement, and Georgia-South Carolina MOA also constitute examples of subsidiarity in the context of addressing transboundary groundwater resources.¹⁴⁶ However, since they do not require congressional approval, they might be classified as examples of *de facto* subsidiarity.

IV. THE SIGNIFICANCE OF LOCAL ARRANGEMENTS

Of the seventeen documents reviewed in this article that address international transboundary aquifers, only five constitute official international agreements: Minutes 242 and 289 of the IBWC, the La Paz Agreement between the US and Mexico, the US-Canadian 1909 Boundary Waters Treaty, and 1978 Great Lakes Agreement.¹⁴⁷ Of these, only Minute 242 directly addresses transboundary aquifer issues. While the other international instruments do

¹⁴¹ See discussion of the Juárez-El Paso MOU, *supra* note 24 and accompanying text.

¹⁴² See discussion of the British Columbia-Washington Agreement, *supra* note 60, Abbotsford-Sumas MOA, *supra* note 63, and Columbia River MOU, *supra* notes 63, and accompanying text for all.

¹⁴³ See discussion of the Great Lakes Charter, *supra* note 45, 2005 Great Lakes Agreement, *supra* note 50, and 2005 Great Lakes Compact, *supra* note 56 and accompanying text for all.

¹⁴⁴ U.S. Constitution, amend. X. See D.W. Kmiec, *Liberty Misconceived: Hayek's Incomplete Relationship Between Natural and Customary Law* 40 Am. J. Juris. 209 at 215 (1995) (portraying subsidiarity as a component of the Tenth Amendment).

¹⁴⁵ See discussion of the Arkansas River Compact, *supra* note 78, Republican River Compact, *supra* note 72, Susquehanna River Basin Compact, *supra* note 69, and Upper Niobrara River Compact, *supra* note 81, and accompanying text for all.

¹⁴⁶ See discussion of the Palouse Basin Agreement, *supra* note 92, SVRP MOU, *supra* note 94, and Georgia-South Carolina Letter Agreement, *supra* note 97, and accompanying text for all.

¹⁴⁷ Official international agreements here are understood as agreements between nations.

contemplate cross-border groundwater resources, they do so very indirectly and only as a secondary or tertiary concern.

Of the remaining twelve instruments, as well as the six US compacts reviewed, all can be construed as either unofficial international (meaning that they are not formally recognized by the respective sovereigns) arrangements or subnational transboundary arrangements. As such, they are not binding under international law and provide little if any evidence of international law or obligations. Yet, all of these arrangements are noteworthy because, to varying extents, all of them directly address groundwater issues that traverse political boundaries. Two complementary conclusions can be drawn from this fact.

The first suggests that the countries of North America have found it more practical to manage transboundary aquifers at the local, rather than at the national, level. Although similar in concept to the principle of subsidiarity discussed earlier,¹⁴⁸ it is not based on political or social interests. Rather, it is a function of practicality and is readily understood when considering the appropriateness of a global versus a local approach to the management of freshwater resources in general. While global framework agreements for transboundary water resources may yet prove to be functional,¹⁴⁹ detailed global arrangements are probably ineffective and inappropriate primarily because the circumstances and conditions of each transboundary water body make it globally unique. Aquifers often affect a restricted community with individual concerns.¹⁵⁰ Geologic, hydrologic, and climatic characteristics, as well as distinctive social, developmental, cultural, and other factors, often require very specific considerations of local circumstances. Moreover, although concerns addressed in disparate regions may appear facially similar, the water challenge in each is typically locally unique necessitating locally tailored solutions.¹⁵¹

¹⁴⁸ See discussion of subsidiarity in notes 137–46 in this article and accompanying text.

¹⁴⁹ For example, while the 1997 Convention on the Law of Non-Navigational Uses of International Watercourses, a framework convention, has not yet come into force, state practice suggests that it has influenced the development of various regional agreements. See G. Eckstein, *Development of International Water Law and the UN Watercourse Convention*, in A.R. Turton and R. Henwood, eds, *Hydropolitics in the Developing World: A Southern African Perspective* 81 at 88–9 (2002). Similarly, in its current effort to formulate international legal principles applicable to transboundary aquifers, the UN International Law Commission has sought to develop principles that apply only generally to all transboundary aquifers and that provide states with a framework for more specific aquifer agreements tailored to each aquifer's and region's unique traits. Cf. Eckstein, *supra* note 2 at 608.

¹⁵⁰ See, for example, Hector M. Arias, *International Groundwaters: The Upper San Pedro River Basin Case* 40 Nat. Resources J. 199 (2000).

¹⁵¹ It is noteworthy that this 'bottom-up' approach, although typically successful, may not be appropriate in all situations. See Huffman, *supra* note 138 at 1381: 'Only where the lower bodies prove ineffective should the federal government become involved.' See R.K. Vischer, *Subsidiarity as a Principle of Governance: Beyond Devolution* 35 Ind. L. Rev. 103 (2001). Factors and characteristics, such as the geographic scale of a transboundary aquifer, for

The majority of arrangements discussed in this article illustrate the advantages of a regional approach. They address local concerns in a way that is both reflective of, and responsive to, local and regional cultures, knowledge, needs, and capabilities. For example, the management techniques and allocation regimes employed for the Hueco Bolson Aquifer underlying the city of El Paso in Texas, United States, and Ciudad Juarez, in Chihuahua, Mexico, is entirely inappropriate for the Abbotsford-Sumas Aquifer found along the border between the US state of Washington and the Canadian province of British Columbia. While the first is an alluvial aquifer located in an arid climate with a rapidly growing population, where the aquifer serves as one of the few sources of water for the entire region, the latter is a mostly unconfined aquifer composed of uncompacted glacial sands and gravels in a more temperate climate.¹⁵² In these two examples, local officials were best able to determine the appropriate mechanism for their unique water challenges. In the case of the Hueco Bolson Aquifer, the municipal utility companies of the bordering sister cities of El Paso and Ciudad Juarez responded to their unique water challenge by entering into a memorandum of understanding that focuses on cooperation and the exchange of information.¹⁵³ In the case of the Abbotsford-Sumas Aquifer, a series of arrangements were forged at the state and provincial level discussing the roles and interaction of relevant permitting agencies and providing for consultation and the exchange of information, as well as creating a joint task force to develop, among others, a joint management plan and aquifer management strategies.¹⁵⁴

The second conclusion that may be derived from the fact that all of the arrangements directly address groundwater issues traversing political boundaries is that, to the extent that these pacts indicate how nations behave in relation to such resources, they may be considered as evidence for the development of customary international law. An assessment of the twelve unofficial international arrangements suggests that the countries of North America allow subnational political units to enter into arrangements

example, may dictate the level of administrative authority necessary to respond to the issues and challenges posed. Thus, where an aquifer or aquifer basin at issue is contained within a limited region, local control of decision-making may suffice. However, where the water challenge involves an aquifer or aquifer basin that transects a much larger area, a local arrangement may be less effective and appropriate.

¹⁵² United States Department of the Interior, *Simulated Ground-Water Flow in the Hueco Bolson, an Alluvial-Basin Aquifer System near El Paso, Texas* 1(4) Water Resources Investigations Report 02–4108 (2003); Jacek Scibek and Diana M. Allen, *Modeled Climate Change Impacts in the Abbotsford-Sumas Aquifer, Central Fraser Lowland of BC, Canada and Washington State*, 1–2 Proceedings of the 2005 Puget Sound Georgia Basin Research Conference, <http://www.engr.washington.edu/epp/psgb/2005psgb/2005proceedings/Papers/E3_SCIBE.pdf>.

¹⁵³ See Juárez-El Paso MOU, *supra* note 25 and accompanying text.

¹⁵⁴ See Abbotsford-Sumas MOA, *supra* note 62 and accompanying text.

addressing transboundary aquifers. At the very least, it suggests that the countries overlook such conduct. In either case, the result is state practice for the purpose of determining customary international law, which, in this case, might be interpreted as a preference by the nations of North America for local solutions to transboundary groundwater issues. A similar conclusion can be derived from a review of the six US compacts presented earlier.¹⁵⁵

V. CONCLUSION

The growing reliance on local and regional agreements for addressing water challenges posed by transboundary groundwater resources in North America indicates a trend in how various levels of government respond to such challenges. Local and regional authorities are no longer waiting for the national governments to exercise jurisdiction over transboundary shared aquifers. Rather, they are negotiating and dealing with their water challenges on their own and at their own levels of authority. At the same time, though, the national governments of North America seem to ignore, if not tolerate, such conduct. This approach appears to differ somewhat from the European experience where local authorities have explicit authority to enter into cross-border arrangements under the European Outline Convention.¹⁵⁶ Nonetheless, the fact that so many of these arrangements are concluded at the local level certainly suggests the development of state practice in North America on the subject. Moreover, it indicates that transboundary groundwater resources are a legitimate subject for international cooperation.

Many of the principles shared by the various North American arrangements discussed in this article are well-recognized aspects of international law and those of transboundary resources generally. These principles are now applied in the groundwater context at a regional level. To the extent that such arrangements represent state practice, they may evidence evolving customary international law in the field. Moreover, both the formats of these agreements and the included normative commonalities can be construed as contributing to such development. To some extent, this may be a trend

¹⁵⁵ While interstate arrangements between subnational political units do not necessarily provide evidence of international state practice, they can, at the very least, be instructive because the issues addressed between the units sharing an aquifer are virtually identical to those experienced among nations sharing an aquifer. Moreover, applying national legal constructs to international law is not unique. For example, the internationally accepted 'equitable and reasonable utilization' norm evolved from the 'equitable apportionment' principle developed by the US Supreme Court in its settlement of interstate disputes among US states. See S.C. McCaffrey, *The Law of International Watercourses*, at 305 (2001).

¹⁵⁶ See European Outline Convention, *supra* note 10 and accompanying text.

by omission—meaning that by staying out of the arrangements achieved at the local and regional levels, the national governments have acted in a manner that establishes state practice. Regardless, this trend should not be ignored. Moreover, the appropriateness and applicability of the principles at the heart of this trend should be considered seriously in the context of other transnational groundwater situations. Considering the experiences and results of the arrangements discussed in this article, these principles may serve as effective tools for successfully managing shared groundwater resources.